

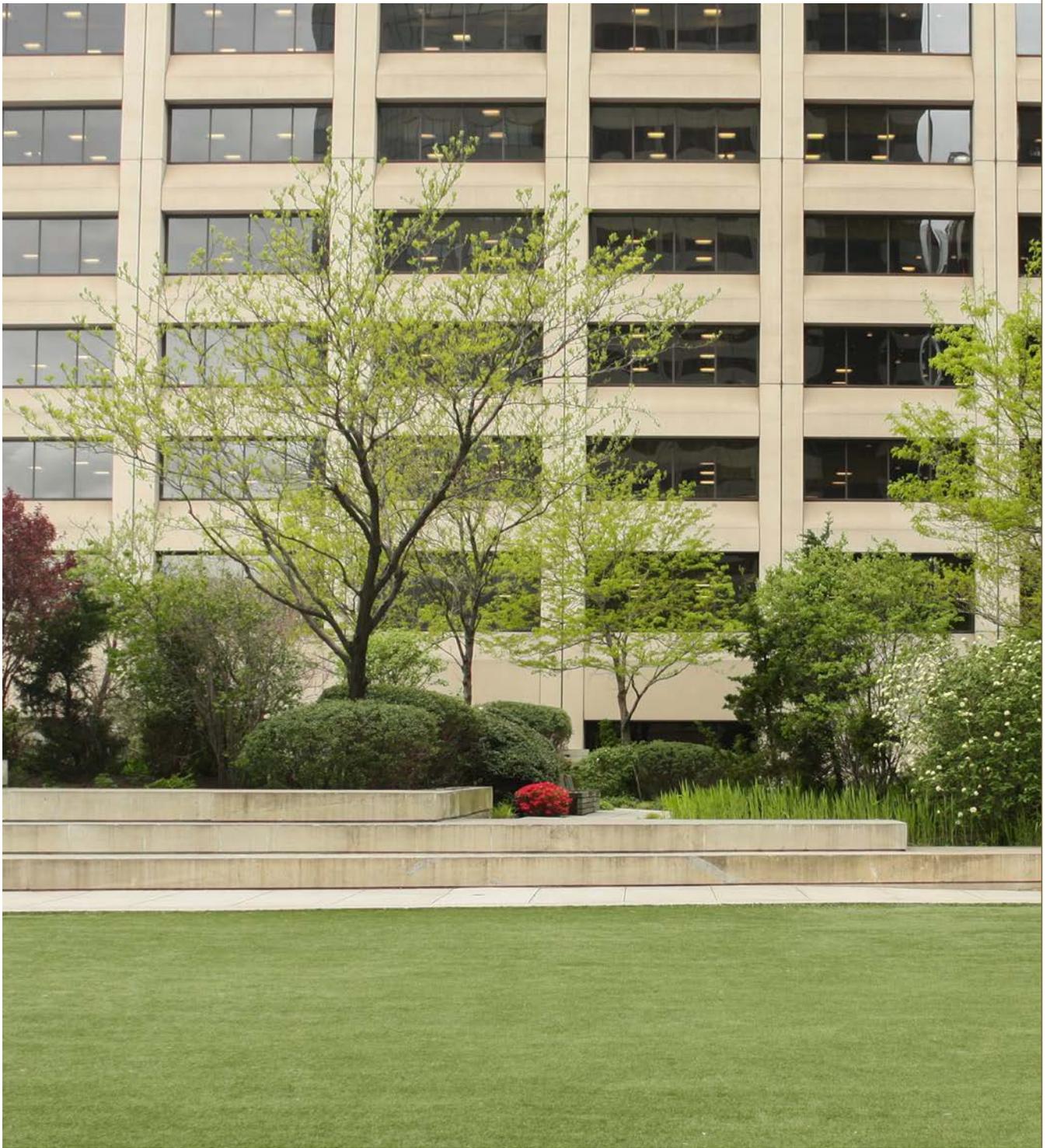
# SEEKING PARKS, PLAZAS, AND SPACES

THE ALLURE OF BIOPHILIA IN CITIES

PREPARED BY SAM GOCHMAN FOR



TERRAPIN  
BRIGHT GREEN



**Elevated Acre in lower Manhattan offers respite from the work day.**

Above and cover image copyright Sam Gochman



## Table of Contents

Executive Summary	5
Investigating Biophilic Spaces in the Urban Environment	6
References	21
Site Descriptions	22

“Our surroundings built and natural alike, have an immediate and a continuing effect on the way we feel and act, and on our health and intelligence.”

– Tony Hiss  
*The Experience of Place*

## Executive Summary

Connection with nature and the resulting benefits for wellbeing are ever-important in an urbanizing world. As populations move to cities, it is important to infuse biophilic urban acupuncture into existing places, creating frequent access to nature in the urban environment and satisfying our biophilic desires. Here Terrapin Bright Green reports on the role of biophilic and non-biophilic spaces for workers in New York.

People on their lunch breaks were interviewed at four sites—two biophilic and two non-biophilic—in lower Manhattan. Results indicate that participants walked a greater distance to biophilic sites, but most routes were short overall, suggesting that convenience is universally important. A large proportion of participants at biophilic sites liked at least one biophilic element most about those spaces and cited both convenience and access to nature as the most important factors in choosing those spaces. At all of the sites, most participants reported that they would walk a longer distance to get to a space with more nature. Results reflect a desire to be in nature, even for those participants at non-biophilic sites. The frequency and quality of urban biophilic interventions should be a main focus for planners, policy makers, developers, and community members in order to maximize the opportunities for restorative and accessible biophilic experiences in the city.

# Investigating Biophilic Spaces in the Urban Environment

## Introduction

As the proportion of the world's population living in cities continues to grow, we must consider the urban environment and its effect on the health and wellbeing of its residents, on the accessibility of green spaces, and on user experience. Urban design strategies that support biophilia—our innate biological and emotional connection with nature—improve the pedestrian experience.

Biophilic urban acupuncture<sup>a</sup> aims to strategically incorporate nature of varying scales into the urban environment, where strong connections with nature are often rare due to competing social and economic pressures. **Ideally, biophilic interventions in cities create a web-like structure of threads and nodes that have an important impact on day-to-day life by supporting personal and community health and wellbeing throughout the city.**<sup>1,2,3</sup> Urban spaces that employ patterns of biophilic design<sup>b</sup> may have a strong attraction for people looking for a restorative escape to nature during their workdays.

In an effort to demonstrate the importance of strategically placed pockets of nature in urban environments, Terrapin Bright Green studied the attraction of these places and their relationship to inhabitants of New York City. Several factors may come into play as people choose a space to occupy. Time spent in a space during a break from work cannot be examined in isolation; the time spent and distance traveled to get to the space are also important to consider, as they may affect a person's willingness to walk to a space during a finite break period. Other interacting factors are alternative destinations, transit cost, age, physical ability, perceived safety of the area, quality of the route, and, importantly for this study, the attractiveness of the destination. Past research documents walking behavior in relation to parks and provides estimates of the average distance walked in urban



**New Yorkers in Bowling Green sit in nature during their afternoon breaks.** Sam Gochman, Terrapin Bright Green

<sup>a</sup> <http://www.terrapinbrightgreen.com/blog/2015/10/biophilic-urban-acupuncture-biophilia-in-urban-places/>

<sup>b</sup> <http://www.terrapinbrightgreen.com/reports/14-patterns/>

environments,<sup>4,5,6,7</sup> but little has yet been studied on the distance or time that people are willing to walk to a space—biophilic or not—during a daily break. Some research suggests that people who have a strong connection to nature travel further for biophilic rather than non-biophilic spaces,<sup>8</sup> but these results are centered specifically on personality type and not on attractiveness of nature to the general population. Thus, there is a need for data that focus on sites with differing biophilic intensities (number and strength of biophilic patterns) and the draw they have on people during a finite time period.

**The presence of nature may be important for a person choosing a place to sit in the city during his/her lunch break—a time constraint that puts value on quality of experience.**

Estimated measurements of distance traveled and time spent traveling, as well as qualitative data about user experience, will help elucidate the trade-offs involved in convenience and experience in nature, potentially pointing to the current successes and insufficiencies of the biophilic urban acupuncture concept and, consequently, ways to improve it with future planning and design.

To gain familiarity with these trade-offs, Terrapin conducted a field study of working individuals out during lunch to answer the following questions: Do people walk farther during their lunch breaks to get to a biophilic space compared to a non-biophilic space? What do people value in a space? Do people's ideals match their actions?

## Methods

Non-biophilic sites, which are common in urban environments, are defined as spaces without the presence of nature. They often are convenient, easy to get to, and close in proximity to other destinations, allowing for flexibility that may be essential for a busy schedule. However, these sites are usually loud, smoky, barren, or non-restorative. Although biophilic spaces may be less accessible to the public than public seating in the street, for example, they can offer greenery, open views, and separation from urban noise and commotion. These connections with nature have impactful benefits for wellbeing, which people may favor over other more convenient locations.

Data were collected from four sites in lower Manhattan, New York, USA: Elevated Acre at 55 Water Street, Bowling Green Park on Broadway & Whitehall Street, 18–25 Broad Street between Beaver Street and Federal Hall, and Pearl Street & Coenties Alley outside 85 Broad Street. Elevated Acre and Bowling Green were put into the “biophilic site” group because of the prevalence and intensity of the biophilic patterns at both locations. Broad Street and Pearl Street & Coenties Alley were put into the “non-biophilic site” group because both sites had weak to non-existent biophilic experiences. For in-depth looks at these spaces and their exhibited biophilic patterns, see Site Descriptions at the end of this document.



**Elevated Acre (top left), Bowling Green (top right), Pearl Street & Coenties Alley (bottom left), and Broad Street (bottom right).** Sam Gochman, Terrapin Bright Green

Data were collected at lunchtime (13:00–15:00) during the workweek in fair weather (i.e., mostly sunny, 65–75°F) from April 21, 2016 to May 19, 2016. After consenting to participate, twenty-five people who were on their work lunch breaks were surveyed from each site, making for a total of 100 participants.

#### QUESTIONS FOR PARTICIPANTS AT BIOPHILIC SITES

1. Did you walk here from work on your lunch break?
2. Where do you work?
3. What do you like most about this space?
4. Is your main reason for sitting here because it is easy to get to or because of the [component of nature in space]?
5. If a space with less nature existed closer to your work, would you go there instead?

#### QUESTIONS FOR PARTICIPANTS AT NON-BIOPHILIC SITES

1. Did you walk here from work on your lunch break?
2. Where do you work?
3. If a space with more nature existed farther from your work, would you go there instead?

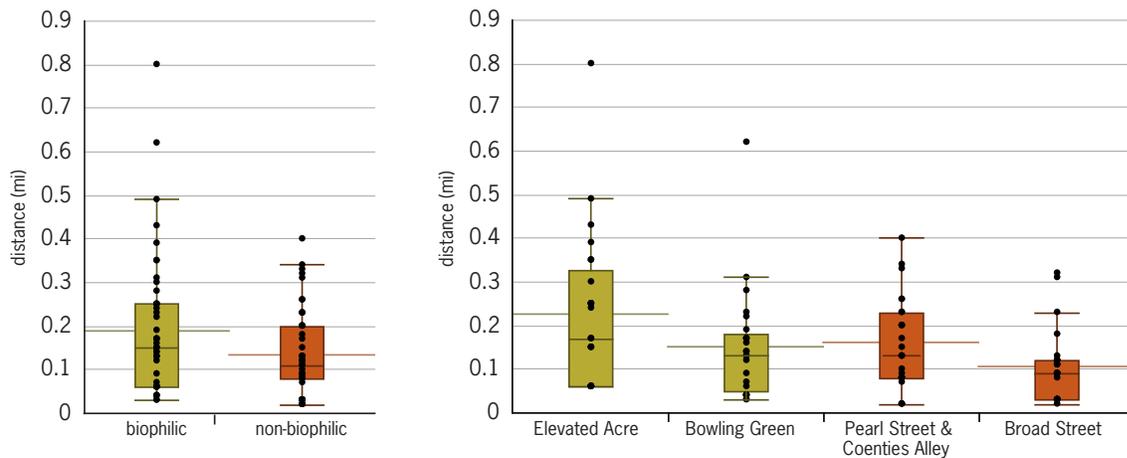
Work locations recorded from all sites were inputted into Google Maps to estimate the distance traveled to the respective site using the most direct path. Time estimates (only used for reference) were calculated from distance measurements using the assumption that the average person walked about a mile in twenty minutes. Data were analyzed in Microsoft Excel and Wilcoxon and Kruskal-Wallis tests were performed in JMP Pro 12.

## Results and Discussion

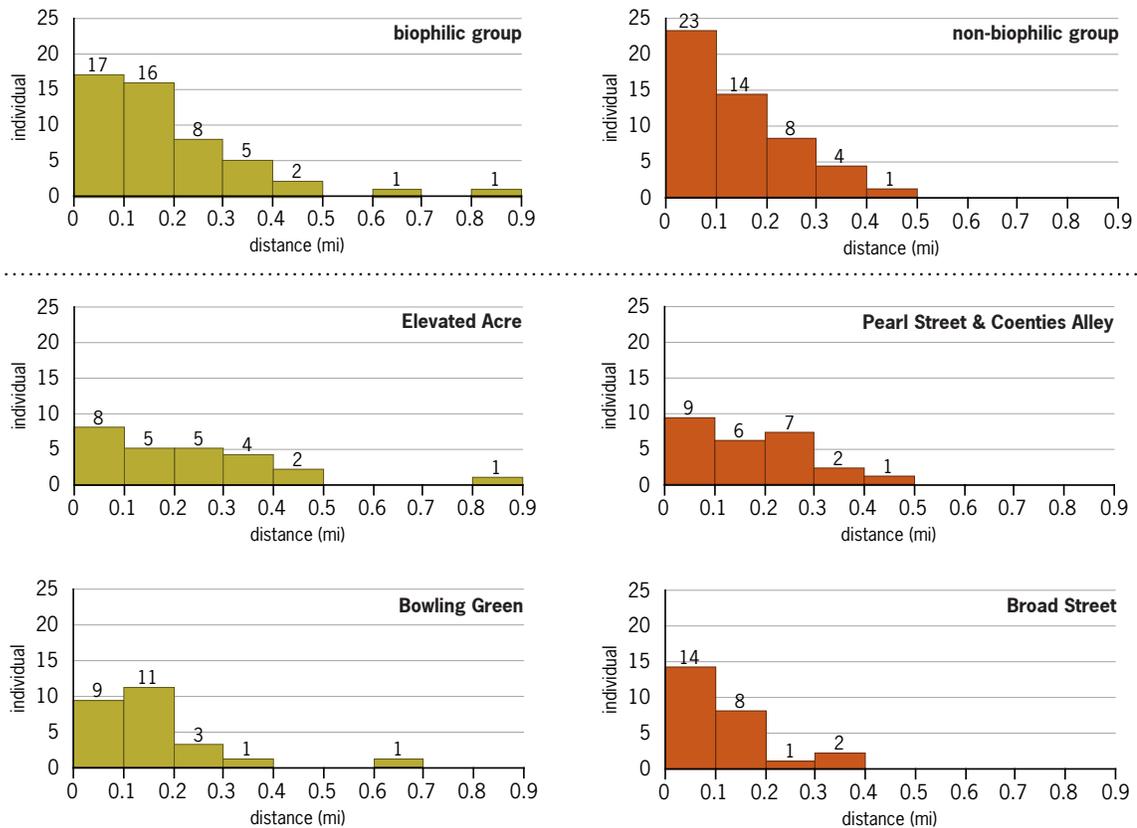
### Distance

When choosing a space to sit during a limited amount of time and weighing the benefits and drawbacks of that space, people in an urban environment often consider factors such as convenience (due to proximity to work and other locations) and overall experience. In order to understand the interaction between these factors, the distance walked from each participant's workplace to each site was measured, as shown in Figure 1.

At first glance, the data show that the biophilic site group attracted people from farther away than did the non-biophilic site group, as seen in the higher median, mean, and maximum. These results indicate a wider reach for sites with nature. More specifically, Elevated Acre had the longest reach and Broad Street the shortest. To statistically test the difference in the distributions of these data, a Kruskal-Wallis test was performed between sites and a Wilcoxon test between site groups. Looking between sites, distances walked to Elevated Acre, Bowling Green, Broad Street, and Pearl Street & Coenties Alley differed significantly ( $P = 0.0208$ ;  $\alpha = 0.05$ ), suggesting that each site is distinct. Looking between site groups, distances walked to the biophilic site group and the non-biophilic site group did not differ significantly ( $P = 0.0684$ ;  $\alpha = 0.05$ ), suggesting that neither biophilic nor non-biophilic sites attracted people from much farther away. It is also useful to understand how many people came from nearby and how many made a longer trip. The histograms in Figure 2 display the distributions of participants according to the distances they traveled.



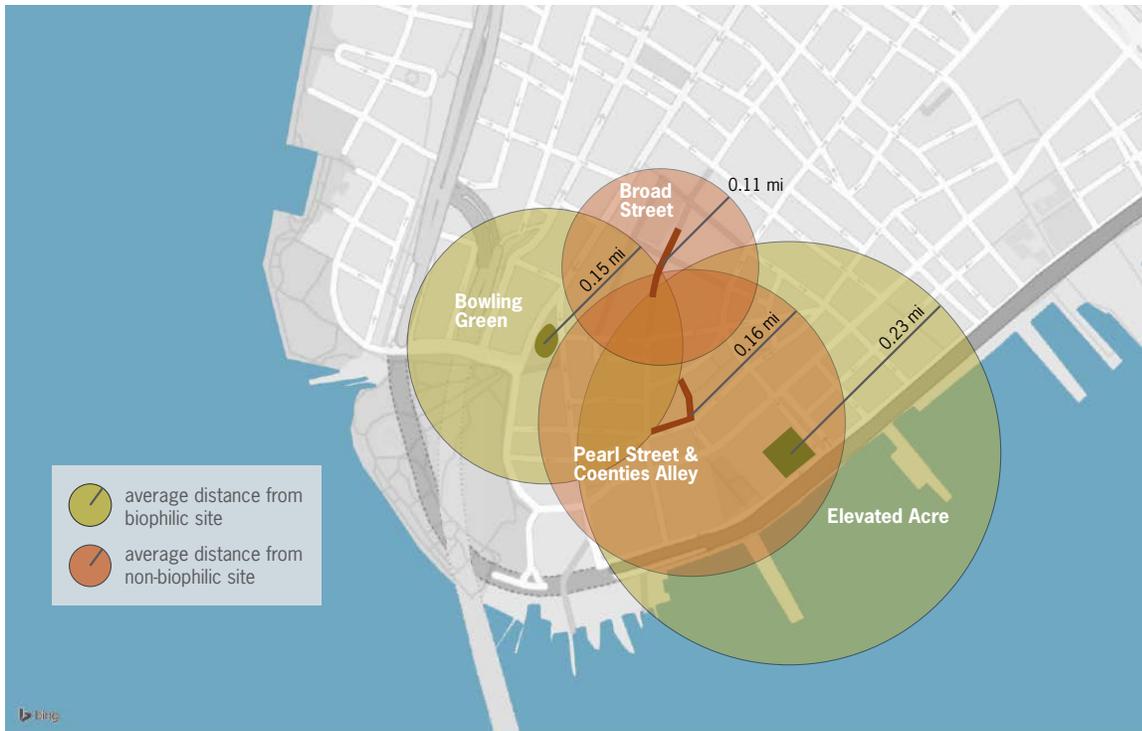
**Figure 1. Left: Comparison of walking distances (miles) by site group ( $P = 0.0684$ ;  $\alpha = 0.05$ ). Right: Comparison of walking distances (miles) by site ( $P = 0.0208$ ;  $\alpha = 0.05$ ). The box-and-whisker plots show the range of distance measurements per site or site group with data represented by points, medians represented by the solid lines across the boxes, means by the longer lines through the boxes, the 25th and 75th percentiles by the lower and upper bounds of the boxes, and the local minima and maxima by the error bars. Green represents biophilic sites and orange represents non-biophilic sites.**



**Figure 2. Histograms show the distributions of participants' walking distances across site groups (top) and across sites (bottom).**

Figure 2 illustrates that **more people walked relatively short distances to get to any of the sites, indicating the importance of convenience. In addition, these distributions show that more people from far away walked to biophilic sites, while people tended to walk less to get to non-biophilic sites.** There is a greater variance (also shown in Figure 1a) in the biophilic sites than the non-biophilic sites, suggesting that biophilic spaces may draw people from a wider area.

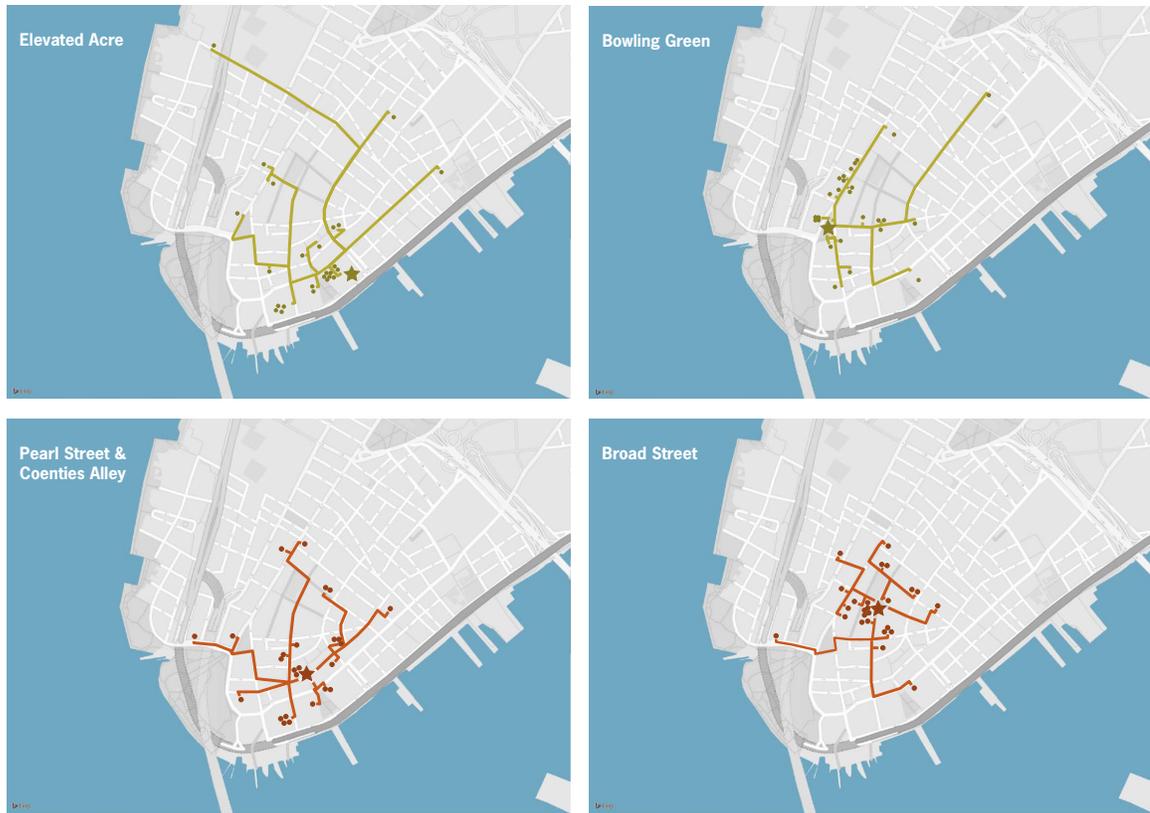
Several factors may contribute to the similarity in distance traveled to biophilic and non-biophilic sites. Convenience is undoubtedly a benefit in choosing a nearby space to spend time. This would be an advantage for any kind of site—especially for non-biophilic sites, where convenience is often the main or only appeal. Although biophilic sites may attract people from farther away than non-biophilic sites, as indicated by the larger maxima (they may be more renowned), they also inevitably attract people from nearby due to convenience (an added benefit). Thus, these two factors may offset each other, resulting in an average distance that is similar to that of non-biophilic sites. At Elevated Acre, this phenomenon may be because the park is surrounded by office buildings, and their workers often simply take the elevator down to the park. Bowling Green may have also had a low mean and median because its location is so close to many workplaces. In other words, its inherent convenience may have somewhat overshadowed the far reach of its biophilic elements. In addition, the intensity of the biophilic experience is weaker at Bowling Green than at Elevated Acre, potentially reducing the attractiveness of the biophilic group as a whole. While the site groups did not differ significantly, the mean, median, and maximum of the biophilic site group were still larger than those of the non-biophilic site group.



**Figure 3. Map shows the reach of four sites (solid filled areas) in lower Manhattan. Radii indicate average distance walked to each site. Green represents biophilic sites: Elevated Acre and Bowling Green. Orange represents non-biophilic sites: Pearl Street & Coenties Alley and Broad Street.**

The distance data provide important information, and a visual representation may be even more useful. Average distances were plotted onto a map of lower Manhattan (Figure 3.) to illustrate each site's reach.

The radii represent average distances, providing a general sense of how far people are willing to travel to each site. It is visually apparent that biophilic sites, as a group, have relatively wide average radii, while the non-biophilic sites are more contained. Perhaps even more telling are the spread of routes traveled to each site, as shown in Figure 4.



**Figure 4.** Maps show the work locations of all participants and the most direct routes to the sites in which they were interviewed. Sites are represented by stars. Green represents biophilic sites and orange represents non-biophilic sites.

By visualizing people’s points of origin, destinations, and routes, it is possible to understand the extent to which each site pulls people through the city. This representation of the data shows the walking patterns and the areas from which people traveled. **The biophilic sites attracted more outliers who walked a disproportionately long distance than did the non-biophilic sites, which drew people from a more defined area.** In addition, the non-biophilic sites are relatively central to their routes, while the biophilic sites are not. This difference may be due to two reasons: 1) Convenience may be important in choosing non-biophilic sites, and 2) the biophilic sites are near a shoreline and major road, which act as barriers to pedestrians. To look at the furthest reaches of each site, Figure 5 isolates their longest routes.

While many participants came from locations relatively close to their destinations (Figure 4), others traveled much longer distances. The maxima of the biophilic sites (0.8 mi for Elevated Acre and 0.62 mi for Bowling Green) exceeded the maxima of the non-biophilic sites (0.4 mi for Pearl Street & Coenties Alley and 0.32 mi for Broad Street), indicating a greater attraction to biophilic spaces.



**Figure 5. Map shows the routes of maximum distance traveled to each site. Green represents biophilic sites and orange represents non-biophilic sites.**

Although no significant statistical patterns between site groups can be gleaned from the distance measurements, qualitative data from the surveys provide useful information about user experience and behavior.

### User Experience

In addition to distance measurements, user responses about the surrounding spaces are another useful source of information. **At biophilic sites, 76% of participants named at least one biophilic element (e.g., greenery, view, flowers, sun) as their most-liked feature of the space.**

At Elevated Acre, most people described an open view as one of their most-liked features of the space, suggesting a strong preference for the biophilic pattern of prospect.<sup>c</sup> They also found the greenery and separation from the street to be attractive. One participant called the park “nature in the city” and another as an “oasis.” Several others described the site as “quiet” even in the presence of a helipad. One participant went so far as to say that the sound itself of the helicopters is relaxing, and another said that it creates a “zen.” This phenomenon is reminiscent of a study by Hunter et al. that looked at the similarities between the sounds of ocean waves and vehicle traffic.<sup>9</sup> Elevated Acre is the least exposed and most private of the sites, with one participant saying that information would have to be “pass[ed] on to know about it.” The participants who named an element that was not necessarily biophilic as their most-liked feature most often said that it was nice public seating.

<sup>c</sup> <http://www.terrabinbrightgreen.com/reports/14-patterns/>



**A hardwood deck on Elevated Acre overlooks the East River and helicopters, which create a relaxing, droning sound reminiscent of ocean waves.** Sam Gochman, Terrapin Bright Green

Participants at Bowling Green largely regarded the site as a nearby space for resting during the workday. Most people mentioned the vibrant red tulips—while they were in bloom—and the fountain as the most liked element of the park. Other responses involved greenery and convenient benches exposed to sunlight. One participant said Bowling Green was a “peaceful little spot” for “quick relaxation” where she could rest her eyes and did not notice the surrounding traffic. These responses widely reflect biophilic patterns such as Visual and Non-Visual Connections with Nature and Presence of Water. Throngs of tourists frequently surround the adjacent iconic Charging Bull and travel to the Battery ferry, yet occupants still seem to focus on the biophilic properties of the space rather than the noise and commotion of the nearby crowds.

## 76% of participants at the biophilic sites identified at least one biophilic element as their favorite feature.

Since a large proportion of people at the biophilic sites named at least one biophilic element as their favorite feature of the space, this supports the concept of biophilia by suggesting that people have a preference for—whether conscious or not—and gain benefits from contact with nature. These responses also indicate that **the experience in the space is worth the effort to get to there.**

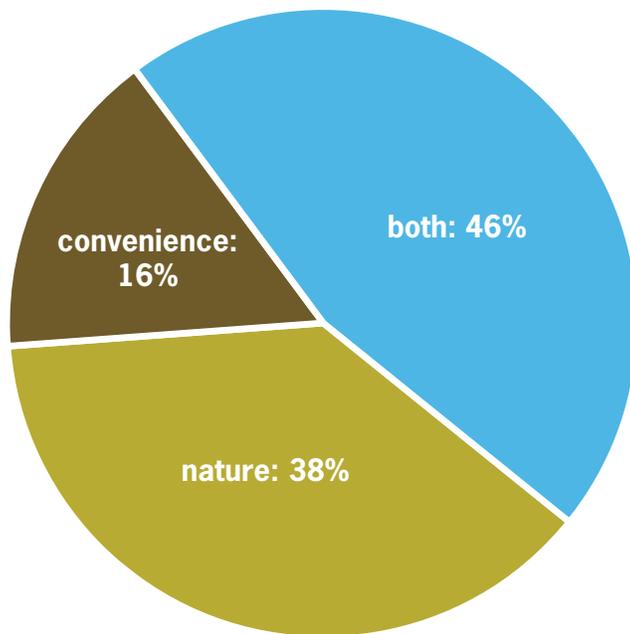


**Bowling Green's flower-lined fountain provides relaxing visual, auditory, and olfactory stimuli to occupants.** Sam Gochman, Terrapin Bright Green

At biophilic sites, responses varied when asked, “Is your main reason for sitting here because it is easy to get to or because of the [component of nature in space]?” 38 participants reported that nature was their main reason for being in the biophilic space, while 16 reported convenience and 46 reported both, as shown in Figure 6. For instance, one person at Elevated Acre said that convenience is most important, but “nature is a plus.”

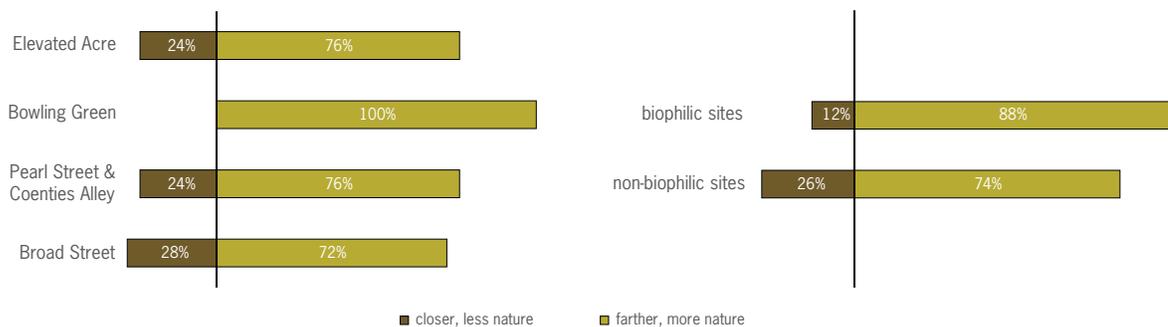
The responses suggest that nature is more attractive than convenience. Still, it seems that convenience is usually important. Participants rarely exceeded the oft-cited quarter-mile walk standard,<sup>5</sup> which translates to roughly a five-minute walk. 20% of participants at biophilic sites walked over a quarter-mile to get there, while only 14% of participants at non-biophilic sites did so, indicating that most people favored a convenient location. Even though convenience was least often cited as a reason for sitting in the biophilic sites, a large proportion of participants valued the combined connection with nature and ease of access more than nature or convenience alone. Together, these responses support the notion that **contact with nature has sought-out benefits, which can be enhanced with convenience.**

When participants at the biophilic sites were asked if they would rather go to a closer space with less nature, and those at non-biophilic sites were asked if they would rather go to a farther space with more nature, responses at all the sites reflected a common perspective (Figure 7). At biophilic sites, 88% of participants reported that they would rather not go to a closer location with less nature. One participant at Elevated Acre said that “other places are easier to get to, but this is nicer” and several others gave similar answers such as, “I could have just stayed in the office,” “I like being in the sun, not in my building,” and “The five minute extra walk was worth it.” Likewise at non-biophilic sites, 74% of participants reported that they would rather go to a farther location with more nature. Overall, 81% of total participants would go farther for a more biophilic experience.



**Figure 6. Reason for site choice.** Proportion of participants who reported that their main reason for being in the space involved nature (green), convenience (brown), or both (blue).

The results suggest that, regardless of where they were found, **most people felt that the benefits of contact with nature outweigh the cost of getting to that space.** At the non-biophilic sites, there seemed to be a disparity between ideals and actions. In contrast to most of their answers, these participants did not go to a space with nature but instead chose the convenient alternative. When probed further about why they chose a non-biophilic area even though they suggested a preference for biophilic areas, they often revealed a priority of convenience over biophilia. This inconsistency between ideals and actions may be at least partially due to people’s inaccurate perceptions of distance to nearby parks. A comparison of self-reported versus objective distance measurements in South Australia showed that the majority of those participants made an overestimate of the distance from their homes to parks.<sup>10</sup> A study in Canada reported that only 11% of participants perceived that they lived less than 750 meters from a park, while objectively, 87% actually did,<sup>11</sup> warning against equating perceptions and actual distance. Perceptions of distance may affect the meaning of convenience and thus may be an important consideration in the placement of biophilic interventions.



**Figure 7. Nature-distance balance by site (a) or site group (b).** Shown are the proportions of participants at each site who preferred a farther space with more nature (green) and the proportion who preferred a closer space with less nature (brown).

## Current Implementation

How can the two needs, contact with nature and convenience, be satisfied? To answer this question, we must understand the role of distance in urban settings. Distance decay is the idea that there is a direct relationship between the closeness of a green space and the frequency of its use. Research indicates that a location less than 100 meters away from a resident is used much more frequently than one beyond 300 meters.<sup>12,13</sup> Cities are beginning to recognize distance decay as a factor in setting goals for enhancing the wellbeing of their residents. In 2013, 2014, and 2015, Minneapolis,<sup>d</sup> Minnesota was ranked #1 in the country for its park system's extensive accessibility, large median park size, and high-quality facilities. While 97%<sup>e</sup> of New York City residents lived within a 10-minute walk of a park in 2014, PlaNYC<sup>f</sup> aims to expand that to all residents by 2030. In 2015, New York received a ParkScore<sup>g</sup> of 40 out of 40 for access, indicating that virtually everybody was living within a half-mile from a public park. And the Trust for Public Land's playground program has created ways for children to transform pavement into local green spaces.<sup>14</sup> In these ways, **cities can strive to remove the obstacles in the way of experiencing nature as to create spaces that are both biophilic and convenient.**



**Minneapolis (left) and New York City (right) are among the cities in the U.S. with the best park systems, rated by accessibility, median park size, and facilities.** Frederico Duarte/Flickr; Sam Gochman, Terrapin Bright Green

<sup>d</sup> [https://www.minneapolisparcs.org/news/2015/05/20/464/minneapolis\\_and\\_saint\\_paul\\_tie\\_for\\_first\\_place\\_on\\_the\\_trust\\_for\\_public\\_land\\_2015\\_parkscore\\_index](https://www.minneapolisparcs.org/news/2015/05/20/464/minneapolis_and_saint_paul_tie_for_first_place_on_the_trust_for_public_land_2015_parkscore_index)

<sup>e</sup> <http://www.scientificamerican.com/article/minneapolis-park-system-ranks-as-best-for-second-year-in-a-row/http://www.scientificamerican.com/article/minneapolis-park-system-ranks-as-best-for-second-year-in-a-row/>

<sup>f</sup> <http://www.nyc.gov/html/planyc/html/sustainability/parks-public-space.shtml>

<sup>g</sup> <http://parkscore.tpl.org/city.php?city=New%20York>

## Design Considerations and Future Directions

As there is a qualitative attraction to biophilic spaces, as well as benefits to wellbeing, access to these spaces through biophilic urban acupuncture can be powerful. To maximize the positive impact of these interventions, policies that call for biophilic interventions should be encouraged so that frequent contact with nature is integrated into urban life. As the distance data suggest that convenience is also important in choosing a place during a break, the creation of more and closer green spaces may also encourage the benefits that come with interaction with nature. For example, a study in Denmark found distance from urban green areas to be directly associated with stress levels and obesity.<sup>13</sup>

In addition to accessibility to biophilic spaces through close proximity, the quality of a space may also be important in encouraging a connection with nature. Our results show that the site with the highest biophilic intensity (Elevated Acre) also had the highest mean, median, and maximum (Figure 1b) measurement of walking distance, suggesting that quality of a biophilic experience matters. Creating more attractive spaces may further encourage walking behavior and contact with nature in the city.

The survey responses reflect a discordance between ideals and actions, indicating that people do not make the choice or effort to be in contact with nature even though they say they would, and this dissonance could be due to the inconvenience of the sites. This issue may be resolved with appropriate design choices that consider the spatial frequency of sites, which could create a tight web of distinct, high-quality, and convenient biophilic interventions. In the effort of supporting biophilic urban acupuncture, interventions of many scales may be implemented, from expansive public parks where acres are available, to a vegetated planter box where space is limited. In this way, **strategic planning and biophilic design that consider a site's size, exposure, entrance, height, and proximity to other spaces and/or buildings (among other factors) can create spaces that are both biophilic and convenient, having a significant impact on people in the urban environment.**

Tactical urbanism—sanctioned or not—may be a form of such strategic planning. Tactical urbanism is the recent phenomenon involving small-scale practical interventions, often initiated by community groups and brought to city agencies and developers, made to improve the livability of cities.<sup>15</sup> Tactics include opening streets for socializing, walking, and cycling; using waste materials to create seating areas; and guerilla gardening, or the conversion of unclaimed pavement into green space. Tactical urbanism can be a powerful tool in promoting targeted access to biophilic spaces.



**Transforming graffiti into green moss creates access to nature in the city.** Rosa Luxemburg-Stiftung/Flickr



**Community members cultivate underutilized space with guerilla gardening.** bundjugendnrw/Flickr



**A parklet in Portland is great an example of a way to bring more biophilic experiences to urbanites.**

kai.bates/Flickr

Our analysis of attraction to spaces of varying biophilic intensities in the city has drawn attention to several interesting topics for further exploration. For example, a future study could take into account more complicated routes, potentially including food stores and restaurants and their relationship to a chosen sitting space. User density may also be measured in different types of spaces to investigate if places with nature attract more people per area. Although not yet directly measured, participants seemed to respond differently to questioning at each site. For example, people at Elevated Acre appeared happier, were more willing to participate in the interviews, and gave more detailed answers than did people on Broad Street. Further research may investigate performance on problem solving tasks in biophilic and non-biophilic sites. Cigarette smokers seemed to be more common in non-biophilic spaces like Broad Street than in biophilic spaces like Elevated Acre. In fact, one participant said that she went to Elevated Acre over a closer place to work specifically because “people smoke too much” there. This prompts a few questions: Where do people smoke, and why? Do people have more respect for biophilic areas? Is there a sense of stewardship inherent to spaces with nature?

## Conclusion

Access to biophilic spaces is crucial to the livability of the cities and the wellbeing of their inhabitants. By exploring the factors involved in choosing a sitting area and the experience of its users, we have gained insights into the role of green spaces in the city. People’s responses reflect that they overwhelmingly value the presence of nature and desire to connect with it, yet for many people, longer travel distances pose a barrier to this objective. Supporting the hypothesized need for biophilic urban acupuncture, our results show that convenience is unexpectedly important, pointing to the demand for both more frequent and higher-quality biophilic interventions in urban spaces. By understanding the city as a web of biophilic and non-biophilic spaces, cities can make restorative experiences even more accessible. This study provides information that can encourage planners, policy makers, developers, and community members to appreciate the value of nature in cities in order to improve access to biophilic spaces for all residents of the urban environment.

## References

1. Larson, L. R., Jennings, V., & Cloutier, S. A. (2016). Public Parks and Wellbeing in Urban Areas of the United States. *PLoS One*, 11(4), e0153211.
2. Jennings, V. L., Larson, C. K., & Larson, L. R. (2015). Ecosystem Services and Preventive Medicine: A Natural Connection. *American Journal of Preventive Medicine*.
3. Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental Science & Technology*, 44(10), 3947-3955.
4. Miller, A. R. (2001). *Valuing open space: Land economics and neighborhood parks* (Doctoral dissertation, Massachusetts Institute of Technology).
5. Atash, F. (1994). Redesigning suburbia for walking and transit: emerging concepts. *Journal of Urban Planning and Development*, 120(1), 48-57.
6. Coutts, C., Horner, M., & Chapin, T. (2010). Using geographical information system to model the effects of green space accessibility on mortality in Florida. *Geocarto International*, 25(6), 471-484.
7. Yang, Y., & Diez-Roux, A. V. (2012). Walking distance by trip purpose and population subgroups. *American Journal of Preventive Medicine*, 43(1), 11-19.
8. Lin, B. B., Fuller, R. A., Bush, R., Gaston, K. J., & Shanahan, D. F. (2014). Opportunity or orientation? Who uses urban parks and why. *PLoS One*, 9(1), e87422.
9. Hunter, M. D., S. B. Eickhoff, R. J. Pheasant, M. J. Douglas, G. R. Watts, T. F. D. Farrow, D. Hyland, J. Kang, I. D. Wilkinson, K. V. Horoshenkov, & P. W. R. Woodruff (2010). The State of Tranquility: Subjective Perception is Shaped By Contextual Modulation of Auditory Connectivity. *NeuroImage* 53, 611–618.
10. McCormack, Gavin R., et al. "Objective versus perceived walking distances to destinations: correspondence and predictive validity." *Environment and behavior* (2007).
11. Lackey, K. J., & Kaczynski, A. T. (2009). Correspondence of perceived vs. objective proximity to parks and their relationship to park-based physical activity. *International Journal of Behavioral Nutrition and Physical Activity*, 6(1), 53.
12. Beatley, T. (2011). *Biophilic cities: integrating nature into urban design and planning*. Island Press.
13. Nielsen, T. S., & Hansen, K. B. (2007). Do green areas affect health? Results from a Danish survey on the use of green areas and health indicators. *Health & place*, 13(4), 839-850.
14. Isaacson, A. (2016, Spring/Summer). Recess by Design. *Land&People*, 30-38.
15. Lydon, M., & Garcia, A. (2015). *A Tactical Urbanism How-To* (pp. 171-208). Island Press/Center for Resource Economics.



# ELEVATED ACRE

RIVERSIDE GREEN  
55 WATER ST, NEW YORK, NY

Three stories above 55 Water Street sits Elevated Acre, a space that has been described as an “oasis in the city.” A full acre, the park has enough area for a rich biophilic experience hidden between skyscrapers and up two escalators. Elevated Acre uses strong biophilic patterns to promote a restorative environment and to attract New York locals, who relax on benches tucked into tall grasses, converse on stacked amphitheater steps, lie down on an open green lawn, and sit overlooking the East River and the lower Manhattan and Brooklyn skylines. The park is even used for catered events and movie screenings.

Among the most prominently employed biophilic patterns is a Connection with Natural Systems, which makes those in the park aware of temporal, seasonal, and climatic states of nature. Open to the elements, Elevated Acre makes visible both immediate weather patterns and long-term changes with the waxing and waning of plants as they grow and fill up the space and then thin out. Prospect has a significant presence, as well. Views across the lawn from all directions allow for comfortable surveillance of the open surroundings, while a perspective over the River focuses on the Brooklyn skyline and engages the viewer with the Presence of Water. Refuge is also evident in the protection of the back provided by tall grasses, bushes, and amphitheater steps, and, at a larger scale, the mountainous buildings that surround the park on three sides.

Although the skyscrapers are apparent, the more immediate flora reinforces the biophilic experience. And even with traffic and a noisy helipad close by, people still enjoy a seemingly quiet atmosphere.

## NATURE IN THE SPACE

- [P1] **Visual Connection with Nature.** Tall grasses, bushes, trees, flowers and soil, and moving water
- [P2] **Non-Visual Connection With Nature.** Bird songs, surfaces warm from sunlight, scents of seasonal flowers
- [P3] **Non-Rhythmic Sensory Stimuli.** Swaying grasses, landscaping of plants, and sounds of birds
- [P4] **Access to Thermal & Airflow Variability.** Cooling breeze, patches of shadow and sunlight, warm surfaces
- [P5] **Presence of Water.** Open view to East River
- [P6] **Dynamic & Diffuse Light.** Direct sunlight, shadows from buildings, dappled light through trees
- [P7] **Connection with Natural Systems.** Open to weather, seasonal changes, budding and retreating plants, change in density of plants

## NATURAL ANALOGUES

- [P9] **Material Connection with Nature.** Artificial green lawn, wooden benches and wooden Beer Garden facade, Brazilian Hardwood boardwalk
- [P10] **Complexity & Order.** Lower Manhattan and Brooklyn skylines, fragmented hardscape staggered with soil and plants, parallel lines seen in seven-tiered amphitheater steps and ribbon windows of surrounding modernist buildings

## NATURE OF THE SPACE

- [P11] **Prospect.** Open views across lawn and out towards the River
- [P12] **Refuge.** Placement between buildings, seating backed by tall grasses and bushes, high amphitheater steps
- [P13] **Mystery.** Staggered benches obscured by weaving bushes and trees, medium-depth views
- [P14] **Risk/Peril.** View off edge of boardwalk on top of moving traffic and River

*Swaying grasses, shrubs, and trees on Elevated Acre engulf occupants, who overlook the lawn and East River. P1 P3 P5 P7 P11 P12*

Prepared by Sam Gochman at Terrapin Bright Green. All images © Sam Gochman



# BOWLING GREEN

URBAN RESPITE  
BROADWAY & WHITEHALL ST, NEW YORK, NY

## NATURE IN THE SPACE

- [P1] Visual Connection with Nature.** Grassy area with trees, bushes, vibrant flowers, birds, and water feature
- [P2] Non-Visual Connection With Nature.** Bird songs, bubbling water, smell of flowers
- [P3] Non-Rhythmic Sensory Stimuli.** Birds chirping, water movement and sounds
- [P5] Presence of Water.** Central water fountain and pool
- [P6] Dynamic & Diffuse Light.** Direct sunlight and dappled light through trees
- [P7] Connection with Natural Systems.** Changes in vegetation, budding, seasonal flowers

## NATURAL ANALOGUES

- [P10] Complexity & Order.** Concentric circle layout of park

## NATURE OF THE SPACE

- [P11] Prospect.** Open view across pool and down aisle, view to surrounding buildings

New York City’s oldest public park, Bowling Green was originally established in 1733 as a turf for lawn bowling, but it now provides a biophilic space for tourists and natives of lower Manhattan alike. The small, grassy teardrop-shaped park is fenced-in and has seating—often filled with many people at a time—down a central aisle and around a large water fountain and pool, which is surrounded by vibrant, fragrant flowers. Tall trees line the park, creating a buffer from the nearby buildings. By employing several strong patterns of biophilic design, Bowling Green gives workers in the Financial District the opportunity to connect with nature during the breaks in their daily schedules.

One of Bowling Green’s most prominent biophilic patterns is a Non-Visual Connection with Nature. Trees attract chirping birds, water bubbles from the fountain, and flowers emit scents, creating a restorative multi-sensory experience among the bustling streets. The Non-Rhythmic Stimuli of the water feature engage occupants with captivating jets of water and sounds that dampen the surrounding noise. The park also exhibits spatial Complexity with its hierarchical layout: a long aisle and concentric circles consisting of a fence, lawn, benches, flowers, and water feature. This arrangement guides users to interact with the nature in the space surrounding them.

*Bowling Green’s open circular plan provides locals enjoying their lunch breaks with views of the flowing central fountain surrounded by vibrant flowers. P1 P3 P5 P10 P11*



**PEARL STREET & COENTIES ALLEY**  
STREET-SIDE SEATING  
85 BROAD ST, NEW YORK, NY

**NATURE IN THE SPACE**

- [P1] **Visual Connection with Nature.** Planters near some benches, trees lining Coenties Alley
- [P2] **Non-Visual Connection With Nature.** Birds chirping in area

**NATURE OF THE SPACE**

- [P11] **Prospect.** Open view down street

On Pearl Street and Coenties Alley, outside of 85 Broad Street, are public benches often used while eating lunch during the work day. Very limited access to biophilic patterns categorizes this urban space as a control—a non-biophilic site. The only vegetation in the space exists as plants between some benches and occasional trees along the street. This brick area lies between restaurants

and tall buildings, is directly exposed to traffic, and is a short walk away from biophilic sites.

*A brick-paved space on Pearl Street & Coenties Alley sandwiched between tall buildings and restaurants provides open seating outside of the office. P11*



**BROAD STREET**  
TACTICAL PEDESTRIAN PLAZA  
18–25 BROAD ST, NEW YORK, NY

**NATURE OF THE SPACE**

- [P11] **Prospect.** Open view down street

Enveloped by the adjacent buildings, moveable tables and seating down Broad Street between Beaver Street and Wall Street provide outdoor space for workers in the Financial District to converse and eat during their breaks. This space was activated for pedestrians post 9-11 when automobile traffic was limited in certain areas of lower Manhattan. Closed off to traffic and a block

away from Federal Hall, the street buzzes with the noise of tours, phone calls, and construction. With no apparent presence of nature, this narrow stretch serves as another non-biophilic site.

*A strip on Broad Street provides convenient public seating with a view to Federal Hall. P11*



# TERRAPIN

BRIGHT GREEN

2105 O STREET NW	25 BROADWAY FLOOR 9
WASHINGTON DC 20037	NEW YORK CITY NY 10004
202.470.0401	646.460.8400

[TERRAPINBRIGHTGREEN.COM](http://TERRAPINBRIGHTGREEN.COM)